

ROBERT F. ALMGREN

POSITIONS

Quantitative Brokers

2008– Co-founder and Head of Research
Venture-funded algorithmic agency brokerage concentrating on fixed-income products and futures.

Courant Institute of Mathematical Sciences, New York University

2006– Visiting Scholar and Adjunct Professor in Financial Mathematics
One semester graduate course each fall on “Financial econometrics and time series analysis”

Bank of America

2005–08 Managing Director (from 2007) and Head of Quantitative Strategies (from 2006)
Electronic Trading Services in Equities division of Banc of America Securities
Client-oriented quantitative research on execution costs and agency equity trading algorithms, with extensions to futures. Development of “Instinct” algorithm that adapts execution to dynamic liquidity.

University of Toronto

2002–05 Director, Master of Mathematical Finance Program
2000–05 Associate Professor of Mathematics and Computer Science (with tenure)
Research in financial mathematics and in free boundaries supported by NSERC. Four M.S. students. Expanded the MMF program by 50%, making it financially self-sufficient and a source of research support for participating faculty, with academic quality top ten in North America.

University of Chicago

1998–2000 Senior Lecturer in Mathematics and Associate Director, Program on Financial Mathematics
1992–98 Assistant Professor of Mathematics
Research on free boundaries in materials science and fluid dynamics, supported by Alfred P. Sloan Foundation (\$30,000) and NSF Career program (\$125,000). Undergraduate and graduate teaching in applied mathematics, and summer program on dynamic and hands-on geometry for elementary school teachers. One Ph.D., one M.S. student. Helped create M.S. Program on Financial Mathematics.

University of Paris VII

Spring 1992 Visiting Postdoctoral Researcher

Courant Institute of Mathematical Sciences, New York University

1989–91 Visiting Member. NSF Mathematical Sciences Postdoctoral Research Fellowship (\$75,000)

EDUCATION

- 1989 Ph.D. in Applied and Computational Mathematics, Princeton University
- 1984 M.S. in Applied Mathematics, Harvard University
- 1983 B.S. in Physics and B.S. in Mathematics, Massachusetts Institute of Technology

PUBLICATIONS**Finance and optimization**

1. T. M. Li and RFA, “A fully-dynamic closed-form solution for Δ -hedging with market impact”, submitted for publication 2011.
2. “Optimal trading with stochastic liquidity and volatility”, *SIAM J. Financial Math.*, to appear 2012.
3. J. Lorenz and RFA, “Mean-variance optimal adaptive execution”, *Appl. Math. Fin.*, 18 (2011) 395–422.
4. RFA and N. Chriss, “Portfolios from sorts,” in revision 2009.
5. “Execution Costs”, in *Encyclopedia of Quantitative Finance*, Wiley 2009.
6. RFA and J. Lorenz, “Adaptive arrival price,” in *Algorithmic Trading III: Precision, Control, Execution*, Brian R. Bruce, editor, Institutional Investor Journals 2007.
7. RFA and J. Lorenz, “Bayesian adaptive trading with a daily cycle,” *J. Trading* Fall 2006.
8. RFA and N. Chriss, “Optimal portfolios from ordering information,” *J. Risk* Fall 2006.
9. RFA, C. Thum, E. Hauptmann, and H. Li, “Equity market impact,” *Risk*, July 2005.
10. RFA and A. Tourin, “Optimal soaring with Hamilton-Jacobi-Bellman equations,” Aug. 2004.
11. RFA and N. Chriss, “Bidding principles,” *Risk*, June 2003.
12. “Optimal execution with nonlinear impact functions and trading-enhanced risk,” *Appl. Math. Fin.*, 10 (2003) 1–18.
13. “Financial derivatives and partial differential equations,” *Amer. Math. Mon.*, Jan. 2002.
14. RFA and N. Chriss, “Optimal execution of portfolio transactions,” *J. Risk* 3 (2000–01) 5–39.
15. RFA and N. Chriss, “Value under liquidation,” *Risk*, Dec. 1999.

Free boundary problems, compressible combustion, geometry teaching, and elasticity

16. K. Glasner and RFA, “Dual fronts in a phase field model,” *Physica D* 146 (2000) 328–340.
17. B. Johnson, R. Sekerka, and RFA, “Thermodynamic basis for a variational model for crystal growth,” *Phys. Rev. E* 60 (1999) 705–714.
18. “Second order phase field asymptotics with unequal conductivities,” *SIAM J. Appl. Math.* 59 (1999) 2086–2107
19. N. Provatas, N. Goldenfeld, J. Dantzig, J. LaCombe, A. Lupulescu, M. Koss, M. Glicksman, and RFA, “Crossover scaling in dendritic evolution at low undercooling”, *Phys. Rev. Lett.* 82 (1999) 4496–4499.
20. A. S. Almgren and RFA, “Phase field instabilities and adaptive mesh refinement,” in *Modern Methods for Modeling Microstructure in Materials*, TMS/SIAM 1996.

21. RFA, A. Bertozzi and M. P. Brenner, “Stable and unstable singularities in the unforced Hele-Shaw cell,” *Phys. Fluids* 8 (1996) 1356–1370.
22. “Singularity formation in Hele-Shaw bubbles,” *Phys. Fluids* 8 (1996) 344–352.
23. “Crystalline Saffman-Taylor fingers,” *SIAM J. Appl. Math.* 55 (1995) 1511–1535.
24. “Computing Laplacian dendrites,” in J. I. Diaz *et al*, editors, *Free boundary problems: theory and applications*, pages 1-12. Longman Scientific and Technical, 1995.
25. RFA, W. Dai, and V. Hakim, “Scaling behavior in anisotropic Hele-Shaw flow,” *Phys. Rev. Lett.* 71 (1993) 3461–3464.
26. “Variational algorithms and pattern formation in dendritic solidification,” *J. Comp. Phys.* 106 (1993) 337–354.
27. “High-frequency acoustic waves in a reacting gas,” *SIAM J. Appl. Math.* 51 (1991) 351–373.
28. RFA, A. Majda, and R. R. Rosales, “Asymptotic analysis of reacting materials with saturated explosion, I. Low-frequency waves,” *Stud. Appl. Math.* 84 (1991) 275–313.
29. RFA, A. Majda, and R. R. Rosales, “Asymptotic analysis of reacting materials with saturated explosion, II. High-frequency waves,” *Stud. Appl. Math.* 84 (1991) 315–360.
30. “Modulated high-frequency waves,” *Stud. Appl. Math.* 83 (1990) 159–181.
31. RFA, A. Majda, and R. R. Rosales, “Rapid initiation in condensed phases through resonant nonlinear acoustics,” *Phys. Fluids A* 2 (1990) 1014–1029.
32. “Geometric Biology for the Chicago Public Schools,” in proceedings of *Inquiry-Based Geometry Throughout the Secondary Curriculum*, St. Olaf College, June 1997.
33. “An isotropic three-dimensional structure with Poisson’s ratio = -1 ,” *J. Elasticity* 15 (1985) 427–430.

PATENT

RFA and N. Chriss, “Method and system for portfolio optimization from ordering information”, United States Patent 7630930, Dec. 2009 (international patent pending).

SELECTED STUDENTS

March 2009	Julian Lorenz, Ph.D. Computer Science, ETH Zürich “Adaptive trading strategies” (I was on his committee and an active coauthor.)
Jan. 2005	Ted Guo, M.S. Computer Science “Artificial market models and agent-based dynamic trading strategies”
Jan. 2004	Vladimir Surkov, M.S. Computer Science “Valuation of mortgage-backed securities in a distributed environment”
Sept. 2002	Raymond Ka Wai Cheng, M.S. Mathematics “Continuous-time models for household portfolios”
June 1998	Karl Glasner, Ph.D. Applied Mathematics (University of Chicago) “Phase field models for dendritic solidification”